Year: 13 Subject: Maths A level	**Curriculum Intent:** Students will understand mathematics and mathematical processes in a way that promotes confidence, fosters enjoyment and provides a strong foundation for progress to further study. Students will build on their year 12 foundations as they tackle the more complex challenges of the course. The course continues with pure, statistics and mechanics content, with a larger focus on modelling and problem solving. All in-class assessments will use prior exam questions and be graded A* to E.					
	Term 1		**Term 2**			
Topic Titles (in order of delivery)	1. Functions 2. Sequences & Series 3. Further Transformations & Modulus function 4. Proof 5. Probability 6. Normal Distribution	1. Further Differentiation 2. Further Integration 3. Differential Equations 4. Numerical Integration	1. Complete Normal Distribution 2. Further Hypothesis Testing 3. Further Calculus and Parametrics 4. Numerical Solutions	1. Further Vectors 2. Forces on a slope 3. Moments 4. Projectiles	1. Review and Revise	1. Review and Revise
Key knowledge / Retrieval topics	1. **Functions**: • Understand the effect of combinations of transformations on the graph of $y = f(x)$ including sketching associated graphs, describing transformations and finding relevant equations. • Understand and be able to use inverse functions and their graphs, and composite functions. Know the condition for the inverse function to exist and be able to find the inverse of a function either graphically, by	• **Further Differentiation**: • Be able to differentiate using the product rule and the quotient rule. • Be able to differentiate using the chain rule, including problems involving connected rates of change and inverse functions. • **Further Integration:** • Be able to integrate e^{kx}, $\frac{1}{x}$, $sin\, k\, x$, $cos\, k\, x$ and related sums, differences and constant multiples.	**1. Complete Normal Distribution** 2. **Further Hypothesis Testing**: • Be able to select an appropriate probability distribution for a context, with appropriate reasoning, including recognising when the binomial or normal model may not be appropriate. • Recognise that a sample mean, $\bar{X}$, can be regarded as a random variable	1. **Further Vectors**: • Be able to use vectors to solve problems in kinematics. • Be able to extend the constant acceleration formulae to motion in two dimensions using vectors: $\boldsymbol{v} = \boldsymbol{u} + \boldsymbol{a}t$ $\boldsymbol{s} = \boldsymbol{u}t + \frac{1}{2}\boldsymbol{a}t^2$ $\boldsymbol{s} = \frac{1}{2}(\boldsymbol{u} + \boldsymbol{v})t$ $\boldsymbol{s} = \boldsymbol{v}t - \frac{1}{2}\boldsymbol{a}t^2$ • Be able to extend the application of	1.	1.

	reflection in the line $y = x$, or algebraically. • Be able to use functions in modelling. 2. **Sequences and Series**: • Be able to work with sequences including those given by a formula for the nth term and those generated by a simple relation of the form $x_{n+1} = f(x_n)$. • Understand the meaning of and work with increasing sequences, decreasing sequences and periodic sequences. • Understand and be able to use sigma notation for sums of series. • Understand and be able to work with arithmetic sequences and series, including the formulae for the nth term and the sum to n terms. • Understand and be able to work with geometric sequences and series including the formulae for the nth term and the sum of a finite geometric series. • Understand and be able to work with the sum to infinity of a convergent geometric series, including the	• Be able to use a definite integral to find the area between two curves. • Be able to carry out simple cases of integration by substitution. • Be able to carry out simple cases of integration by parts. • Be able to integrate functions using partial fractions that have linear terms in the denominator. • **Differential Equations:** • Be able to construct simple differential equations in pure mathematics and in context (contexts may include kinematics, population growth and modelling the relationship between price and demand). • Be able to evaluate the analytical solution of simple first order differential equations with separable variables, including finding particular solutions. • Be able to interpret the solution of a differential equation in the context of solving a problem, including identifying	• Be able to conduct a statistical hypothesis test for the mean of a normal distribution with known, given or assumed variance and interpret the results in context. • Understand Pearson's product-moment correlation coefficient as a measure of how close data points lie to a straight line. • Use and be able to interpret Pearson's product-moment correlation coefficient in hypothesis tests, using either a given critical value or a p-value and a table of critical values. **3. Further Calculus and Parametrics:** • Understand and be able to use the second derivative in connection to convex and concave sections of curves and points of inflection. • Be able to apply differentiation to find points of	differentiation and integration to two dimensions using vectors: $x = f(t)\,i + g(t)\,j$ $v = \frac{dx}{dt} = \dot{x}$ $= f'(t)i + g'(t)j$ $a = \frac{dv}{dt} = \dot{v} = \frac{d^2x}{dt^2}$ $= f''(t)i + g''(t)$ $x = \int v dt$ and $v = \int a dt$ • Be able to model motion under gravity in a vertical plane using vectors where $a = \begin{pmatrix} 0 \\ -g \end{pmatrix}$ or $a = -gj$. 2. **Forces on a slope**: • Be able to extend use of Newton's second law to situations where forces need to be resolved (restricted to two dimensions). • Be able to extend use of Newton's third law to situations where forces need to be resolved (restricted to two dimensions). • Be able to use the principle that a particle is in		

	use of $\|r\| < 1$ and the use of modulus notation in the condition for convergence. • Be able to use sequences and series in modelling. 3. **Further Transformations & Modulus function**: • Understand the effect of simple transformations on the graph of $y = f(x)$ including sketching associated graphs, describing transformations and finding relevant equations: $y = af(x)$, $y = f(x) + a$, $y = f(x + a)$ and $y = f(ax)$, for any real a. • Be able to sketch the graph of the modulus of a linear function involving a single modulus sign. • Be able to sketch the graph of the modulus of a linear function involving a single modulus sign. • Understand and be able to use the definition of a function. • Understand and be able to use the modulus function, including the notation	limitations of the solution. • **Numerical Integration**: • Understand and be able to use integration as the limit of a sum. • Understand and be able to use numerical integration of functions, including the use of the trapezium rule, and estimating the approximate area under a curve and the limits that it must lie between.	inflection on a curve. • Understand and be able to use the parametric equations of curves and be able to convert between cartesian and parametric forms. • Be able to differentiate simple functions and relations defined parametrically for the first derivative only. • Be able to use parametric equations in modelling in a variety of contexts. **4. Numerical Solutions:** • Be able to locate roots of $f(x) = 0$ by considering changes of sign of $f(x)$ in an interval of x on which $f(x)$ is sufficiently well-behaved. • Understand how change of sign methods can fail. • Be able to solve equations approximately using simple iterative methods and be able to	equilibrium if and only if the sum of the resolved parts in a given direction is zero • Be able to resolve forces for more advanced problems involving connected particles and smooth pulleys. • Understand the term 'resultant' as applied to two or more forces acting at a point and be able to use vector addition in solving problems involving resultants and components of forces. • Be able to solve problems involving the dynamics of motion for a particle moving in a plane under the action of a force or forces. • Be able to represent the contact force between two rough surfaces by two components (the 'normal' contact force and the 'frictional' contact force). • Understand and be able to use the		

	$\|x\|$, and use relations such as $\|a\| = \|b\| \Leftrightarrow a^2 = b^2$ and $\|x - a\| < b \Leftrightarrow a - b < x < a + b$ in the course of solving equations and inequalities. 4. **Proof**: • Understand and be able to use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion. • Be able to show disproof by counter example. • Understand and be able to use proof by contradiction. 5. **Probability**: • Understand and be able to use conditional probability, including the use of tree diagrams, Venn diagrams and two-way tables. • Understand the concept of conditional probability and calculate it from first principles in given contexts. • Be able to model with probability, including critiquing assumptions made and the likely effect of more realistic assumptions. 6. **Normal Distribution**:		draw associated cobweb and staircase diagrams. • Be able to solve equations using the Newton-Raphson method and other recurrence relations of the form $x_{n+1} = g(x_n)$. 5. Understand and be able to show how such methods can fail.	coefficient of friction and the $F \leq \mu R$ model of friction in one and two dimensions, including the concept of limiting friction. • Understand and be able to solve problems regarding the static equilibrium of a body on a rough surface and solve problems regarding limiting equilibrium. • Understand and be able to solve problems regarding the motion of a body on a rough surface. 3. **Moments**: • Understand and be able to use the unit for moment (N m). • Be able to calculate the moment of a force about an axis through a point in the plane of the body. • Understand that when a rigid body is in equilibrium the resultant moment is zero and the resultant force is zero.		

	• Know and be able to use the formulae $\mu = np$ and $\sigma^2 = npq$ when choosing a particular normal model to use as an approximation to a binomial model. • Understand and be able to use the normal distribution as a model. • Be able to find probabilities using the normal distribution, using appropriate calculator functions. • Understand links to histograms, mean and standard deviation.			• Be able to use moments in simple static contexts. 4. **Projectiles**: • Be able to model the motion of a projectile as a particle moving with constant acceleration and understand the limitation of this model.		
Understanding / Sequence of delivery	1. Building on prior knowledge and making connections between topics.					
Assessment	End of Topic Assessed Homework Integralmaths.org online topic assessments		End of Topic Assessed Homework and Practice Papers Integralmaths.org online topic assessments		Practice Papers	
	Class tests. Past Exam Questions Grade Boundaries based on A Level 2019-2024		PPE & Class tests. Past Exam Questions Grade Boundaries based on A Level 2019-2024		A Level Exams	